INTRODUCTORY ADDRESSES

DELIVERED AT THE MEDICAL SCHOOLS.

ON

OLD AGE.

*Delivered at the Opening of the Session of the Medical
Department of the Yorkshire College, Victoria
University, Leeds.*

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LADIES AND GENTLEMEN,—My ready acceptance of the honouring invitation given to me by the teaching staff of the medical department of the Yorkshire College to deliver an address to students and others at the opening of a new session was followed by an intimation that I was at liberty to choose my own subject, and I therefore stand before you to-day in the enjoyment of a glorious freedom which I find almost more embarrassing than the narrowest restrictions could have been. I pause dubiously before venturing forth on any one of the many excursions suggested by the occasion and the audience that tempt me on every side. But the very freedom accorded to me imposes on me a special obligation, to have regard to the traditions and customs of an occasion like the present, and, bearing in mind the purpose with which inaugural addresses of this kind were originally instituted, I must first say a few words of welcome to those who to-day begin or, at several stages of advancement, renew their medical studies, and stand in the vestibule of that profession which I have myself inhabited with pride and satisfaction for upwards of a quarter of a century. On many platforms this afternoon such words of welcome are being spoken. In many medical halls, for many years past, they have echoed annually on this day, but repetition can never reduce them to mere empty formalities, or rob them of a deep significance, for they express an emotion which springs perennial in the human breast, and which, like all genuine emotion, gives vital freshness to the most threadbare phraseology—an emotion of generous sympathy with youth as it buckles on its armour and prepares itself for the battle of life. I trust, therefore, that the students who are assembled here will believe that when, on behalf of their teachers, I greet them on the threshold of a new session, I participate in some measure in their own high hopes, and wish them with the utmost cordiality all worthy success in the career of anxious and strenuous, but noble, toil upon which they are about to enter.

We are often told in these days—and truly told—that the medical profession in this country is overstocked, and that the struggle for existence amongst its members is growing in keenness and severity; and we should be cautious, therefore, in holding out inducements which may tend to swell the crowd that is pressing into it. But I am speaking now to those who have already joined that crowd and committed themselves to a medical career; and to them I can unhesitatingly offer my congratulations on their choice of a calling, which with all its drawbacks is singularly interesting and attractive, and confers an exceeding great reward—not rank or riches, or vulgar notoriety, but enlightenment and usefulness, and the consciousness of good work well done in the service of man—on all who with natural aptitude diligently seek it. But natural aptitude and diligence are alike necessary in order that the medical profession, and, indeed, any profession, may be followed with success; and most of the failures in life which we see around us are due to the lack of one or other of these; and it is the absence of natural aptitude that is perhaps oftenest at the root of the evil, for diligence can scarcely be expected in those who have somehow been set to work for which they have neither heart nor talent, and against which they may even feel a deep-rooted repugnance.

There is in the city of Lyons an establishment of great public importance called the silk-conditioning house, in which that most costly of fibres silk is subjected to careful tests as to its uniformity and strength and the amount of moisture and foreign matter it contains while still in the raw state, so that the most suitable application in manufacture of each lot from which a sample is taken may be accurately determined. Well, I sometimes wish that we had a brain-conditioning house in this country in which that most precious of fibres—nerve tissue—might be skilfully tested as to its quality and capabilities while still in the raw state, and advice given as to the sort of industrial application for which each specimen of it is best adapted. Precocious boys and brilliant boys with a spark of genius in them no doubt display special proclivities in their early years, and their appropriate life-course is easily determined; but immense numbers of average boys complete their school curriculum without having developed any predilections, and their parents and guardians are often puzzled to know how to employ them to the best advantage. Their schoolmasters can afford but the vaguest and most untrustworthy suggestions, and they themselves, if they have any definite inclinations, have probably derived them from one of Mr. Rider Haggard's novels rather than from a decisive bent of character or appreciation of their own powers. In eight cases out of ten, I feel sure a boy's profession is chosen in a haphazard way, with an eye to some supposed opportunity, not with any regard to his constitutional endowments, and the consequence is that there is much waste of time and energy, much scamped work, much discontent, and sometimes deplorable deterioration of character.

In reviewing the case of a notorious criminal who was executed in Canada last year, Professor Goldwin Smith said that had Birchall been kept steadily at work at some useful manual occupation he might have gone decently, perhaps creditably, through the world. The mistake which sealed his doom was sending him to college, where, having no literary tastes, he was sure not to study, and where, being idle, he was sure to fall into dissipated habits, and the depravity to which these inevitably lead.

It is properly the function of the father, whose knowledge of his son's temperament and abilities ought to be of the most complete and intimate kind, to guide the son's steps into that walk of life in which he is likely to travel most profitably. But parental duties in these modern times are to a large extent performed by deputy—by nurses, governesses, and tutors—and it not seldom happens that when the time arrives to start the son upon his independent journey, the father discovers that he is wholly ignorant of his gifts and attainments, or has formed a very erroneous conception of them. "What shall we do with our boys?" is a question piteously asked in innumerable households, and which as often arises out of inability to say what these boys are really fit for, as out of a surplussage in their number, or a difficulty in finding openings for them.

Could efficient assistance be given to parents in choosing professions for their sons, not by empirics—like the practical phrenologists who are sometimes, I am told, resorted to for this purpose, and who found their advice upon the observation of the supposititious organs in which they have located their fictitious faculties—but by skilled men and scholars, capable of estimating physical as well as mental potentialities, then much suffering would be avoided and good accomplished. A brain-conditioning house, therefore—an establishment standing between preliminary and professional education, in which the former might be proved, while the latter was approached by scientific methods in which the staple of intellect would be determined, and traits of character, good and bad, accurately appraised, and in which due regard would be given to those latent pathological tendencies which really form an integral part of the personal identity of each of us—a brain-conditioning house of this kind is not a mere whimsical suggestion, but a practical want of the age, needed to meet the requirements of a large class of cases, and if established would soon encroach on the trade of the indiscriminate and brain-destroying crammer.

But a brain-conditioning house is less necessary in relation to the medical profession than to any other, for an immens

majority of those who adopt it possess, I believe, a special aptitude for it. In Leeds—so long distinguished for its great medical families—it can be scarcely necessary to remind you that the principle of hereditary succession rules to some extent in the medical profession, and that in a great number of instances father has been succeeded in it by son for several generations, but hereditary succession of this kind generally involves some degree of hereditary predisposition, and we may depend upon it that when a medical father has several sons he is shrewd in selecting for his own calling the one best suited for it. And where no hereditary predisposition can be traced special aptitude may still be inferred in those who devote themselves to the medical profession, for that profession holds out no gaudy allurements to the young; it promises neither wealth nor high social distinction, nor luxurious ease, and demands studies that are laborious and, in some aspects, repellant, and we may feel sure, therefore, that most of those who seek admission to it are moved by a genuine love of natural knowledge and by a sincere, if unparaded, desire to do something to mitigate the sufferings of their fellow-men. The fact that those who enter medicine have almost invariably some original leaning towards it accounts partly for the deep attachment to their profession, notwithstanding the heavy calls it makes upon them, felt by almost all medical practitioners. As with engineers, who are also, I believe, most commonly led to adopt their occupation by natural aptitude—a taste for mechanics and physical science—developed in early life, and who are, I have noticed, wrapped up in their work and exempt from the mental dyspepsia which uncongenial and indigestible occupation brings on—as with engineers so is it with doctors; they love their work with all its irksomeness and anxieties, and feel the artist's elation in doing it well; there are but few deserters from their ranks, and you rarely if ever hear from their lips the querulous complaints that men of other callings often utter, to the effect that they have mistaken their vocation, have not met with their deserts, or have never had a fair field for the display of their abilities. I can confidently assure you gentlemen who are here to dedicate yourselves to medicine that you will never regret your choice if that choice has been in any degree prompted by natural aptitude. But besides natural aptitude, diligence, steady diligence, is essential in those who would successfully pursue the study of medicine and learn to solve the complicated problems of disease and command the manifold resources of the healing art. And as time goes on the need for diligence on the part of the student of medicine becomes more and more pressing, for new methods of investigation are constantly being devised and new remedies introduced. In order to obtain a qualification to-day he must not only be expert in all the old means of physical diagnosis, but he must possess an accurate acquaintance with the chemistry of the secretions which was unattainable in former days; he must be familiar with the microscopic appearance of the tissues in health and disease which modern research has revealed; and he must be an expert in the use of the ophthalmoscope, laryngoscope, otoscope, and other instruments which are of quite recent invention, and of electrical apparatus which is hourly undergoing improvement. And only as it were yesterday a new burden has been laid on his long-suffering shoulders, for henceforth it must be incumbent on him to be able to identify every variety of bacillus, coccus, and spirillum, and to penetrate into all the mysteries of gelatine films and aniline dyes.

Notwithstanding, however, the additional labour which it imposes on him, the new branch of study—bacteriology—will certainly secure the medical student's earnest and eager attention. The splendid triumphs of antiseptic surgery, the brilliant discoveries of Pasteur, Klebs, and Koch cannot fail to impress his imagination, while the near prospect of practical results of incalculable value from micro-biological investigations must stimulate his spirit of scientific enterprise. There will be no lack of workers in the field of bacteriological research in the next decade. Medical students and medical practitioners will press forward to investigate the habits of micro-organisms under various conditions and the influence that they or their products exert on living and dead protoplasm, to identify such of them as are associated with disease processes in animals and plants, to trace out the channels of their propagation, and to discover means by which their

effects may be counteracted, or immunity against their attacks conferred. And no one would wish to diminish the number or dim the ardour of those who are willing to engage in so necessary and promising a work. There cannot be too much or too vigorous bacteriological investigation, but, at the same time, it may be well to remember that there are many ills that flesh is heir to that are not dependent on fission fungi, and that medical science is bound to have regard, not merely to specific infective diseases, but to departures from health of every kind. I shall not, perhaps, unprofitably occupy your time this afternoon—the time, I mean, of such of you as are to be our future practitioners of medicine—if I remind you of the wide scope of your professional commission, plead for your assiduous study of degenerative not less than of fermentative changes, and endeavour to fix your attention on the latter half of life, when the accumulated effects of wear and tear assert themselves, rather than on its first half, when pathogenic bacteria run riot.

It is of old age that I would speak to you, and the subject, although at a first glance it may seem of little immediate concern to you, still in the heyday of your youth, is yet well deserving of your thoughtful consideration, for it ought to be one of your great aims in life to grow old yourselves, and to be the cause of old age in others.

Now the popular impression assuredly is that it is well with old age in these days. Paragraphs which appear in the newspapers now and again, pointing out that a dozen old people whose deaths are recorded in the *Times* on some particular day have collectively beaten the record of Methuselah, and the striking decline in the death-rate of England and Wales which has been going on for the last thirty years has created a belief, fostered by those genial optimists whom we have always with us, that we are advancing towards health and longevity all along the line. Well, the reduction in the death-rate in this country is an indisputable and gratifying fact. The new census returns indicate that that reduction has not been quite as great as our calculations founded on estimated population had led us to hope, but still it has been large and remarkable. The improved drainage of land and construction of houses, the enforcement of vaccination, the vastly increased attention bestowed on cleanliness (personal, domestic, and civic), and on all sanitary requirements, and the accumulated wealth of the nation leading to a higher standard of living, have resulted in an enormous saving of life, but I must call upon you to note what is often overlooked, that this saving of life has been effected mainly in its first half. It is amongst infants, children, and young persons, that the large reduction in the death-rate has taken place, while amongst persons past middle age the reduction in that rate has been comparatively trifling. I am not going to worry you with statistical tables which I have prepared, but I may tell you generally that since the year 1859 the decline in the death-rate has been 17.6 per cent at all ages under 55, and only 2.7 per cent at all ages above 55. The principal decline has taken place at ages under 35; after 45 the decline is insignificant, and from 65 to 75 there has actually been an increase in the death-rate.

It is incontestable that old age is being slowly shortened, and that the present increased mortality at higher ages cannot be explained by diminished mortality at lower ones, even supposing increased delicacy in those who survive. Statisticians will tell us that it is the most valuable lives—those with the longest prospect of life and of productive activity—that are being saved, but that view scarcely commends itself to one who, like myself, has passed the zenith, and you will probably agree with me that it is not satisfactory to find in our population an enormous increase of babies, children, and callow young men and women, without any proportionate increase in the number of ripe and experienced specimens of our race, of goodly matrons and tried veterans.

But matrons and veterans—ripe and experienced specimens of our race—have participated with the young and immature in the benefits of those improved sanitary and social conditions to which the reduction in the death-rate has been ascribed. Fever, small-pox, and phthisis have been less fatal to the aged of late years than they formerly were; and if the death-rate due to them has diminished while the general death-rate has risen, it is clear that the mortality from some other diseases must have increased to an extent to compen-

sate for the diminution thus caused, as well as to account for any increase in the general death-rate.

What, then, are the diseases which have become more prevalent and fatal of late years, and in consequence of the increased fatality of which fewer persons in this country can expect to reach old age? A detailed answer to that question would involve long explanations and abstruse figures, but my present purpose will be served by naming to you three or four of the diseases, or groups of diseases, the mortality from which is largely on the increase. Cancer carried off 35,654 persons in England and Wales in the five years from 1859 to 1863, but it destroyed no fewer than 81,620 in the five years from 1884 to 1888, the ratio of deaths from it being 354 per million living in the former period, and 585 per million in the latter, and seven-eighths of the victims of malignant cancer are above 45 years of age. Heart diseases carried off 92,181 persons in the five years 1859 to 1863, but they destroyed 224,102 persons in the five years 1884 to 1888, the ratio of deaths to each one million living being 915 in the former quinquennium and 1,696 in the latter, and the heavy mortality from these diseases falls after 35 years of age. Nervous diseases carried off 196,906 in the five years 1864 to 1868, but they destroyed 260,558 persons in the five years 1884 to 1888, the ratio of deaths to each one million living being 1,585 in the former quinquennium and 1,793 in the latter, and the increased mortality from these diseases comes after 35. Kidney diseases carried off 23,176 in the five years 1859 to 1863, but they destroyed 61,371 persons in the five years 1884 to 1888, the ratio of deaths to each one million living being 230 in the former and 445 in the latter quinquennium, and these diseases are most fatal in middle and advanced life.

Now it may be shown conclusively that the increased mortality from the diseases enumerated cannot be attributed to greater precision in diagnosis and care in registration, for the increase due to them much exceeds the decrease of mortality from all other causes, so it is a real and not apparent increase that we are confronted with, and the cause of that real increase is not difficult to discover. All the diseases and groups of diseases quoted are degenerative in their nature, and may be traced for the most part to wear and tear, to the stress and strain of modern life. Cancer (whether or not we regard it as of microbic origin) depends practically for its development upon senility of the tissues—that is to say, upon those changes in them which are peculiar to old age; and whatever tends to hasten senility, either local or general, tends to heighten the liability to malignant disease. It is because men and women, under the high pressure of civilisation, grow old before their time that cancer, which is unknown in wild animals, but is frequently seen in animals in a state of domestication, is spreading so portentously amongst us. Heart diseases are due to rheumatic fever in which there is probably a nervous element, or to the functional disturbances of the organ which the worry, haste, and excitement of modern life are perpetually inducing. "I may venture to assert," said one of our most distinguished pathological authorities (Dr. Coats, of Glasgow) lately, "that the constitutional powers of the heart and great arteries are the principal factors in determining longevity;" and from this it follows that whatever undermines these constitutional powers hastens senility and cuts short life. Nervous diseases spring directly in a vast majority of instances from the abuses and exhaustive engagement of the brain and its tributaries in the battle of life; and it is because that battle is yearly growing fiercer that these diseases multiply so rapidly amongst us. Kidney diseases, again, are due to the intemperance which the sudden and excessive demands of modern life on the system promote, or to the vexations and disappointments of which the struggle for existence produces so plenteous a crop. Activity and restless mobility invariably tend to the destruction of organised bodies, and defective adaptation to external conditions that are changing rapidly is one of the commonest causes of the curtailment of life. Wear and tear, resulting in untimely old age, is the final explanation of the increased mortality which we see around us in the latter half of life: the wear and tear, be it remembered, begins in the nursery, thanks to the competitive dispensation under which we live. The influence of wear and tear in the causation of increased mortality at advanced ages becomes very apparent if we contrast the death-rate at different

ages in an urban population in which high pressure existence prevails with that in a rural population in which life is still comparatively tranquil. In the eighth registration district of England and Wales, comprising Lancashire and Cheshire, the proportions of total deaths per cent. were, in the three years 1880 to 1882, 85.9 under 65 years of age, and 14.1 above it; whereas in the fifth registration district, including Wiltshire, Dorsetshire, Devonshire, Cornwall, and Somersetshire, it was 68.5 under 65 years of age, and 31.5 above it. It thus appears that in country districts the number of persons surviving 65 years is more than double the number surviving that age in large towns; and allowing for the fact that the young migrate to towns in larger proportion than those advanced in life, the inference is still unavoidable that the conditions of life in large towns, of which excessive wear and tear is the most important, are not favourable to longevity. And as our urban is constantly growing at the expense of our rural population, in obedience to tendencies which are likely to gather strength as time goes on, the prospect is that old age will become a scarce commodity in this country unless new means of checking degenerative changes are discovered.

The same lesson as to the life-shortening effect of wear and tear is taught by a glance at the distribution of mortality between the sexes. Women, who have not yet to bear the brunt of competition as much as men, reach advanced ages in far larger proportion than men do. Of the centenarians who died in England and Wales in 1889, 55 were women and only 21 men, and of the deaths from old age certified in the same year 15,364 were of women and only 11,275 of men.

But still more unsatisfactory reflections in connection with old age remain behind, for it would seem that if that stage of life is being shortened at one end, the end at which we should gladly see it extended, it is being lengthened at the other end, the end at which we should gladly see it abbreviated. While increasing mortality from degenerative diseases diminishes our prospects of enjoying a ripe old age, the increasing prevalence of minor degenerative changes enhances the probability that we shall be plunged into a premature old age, and become decrepit while still in what used to be considered the prime of life. Men and women are growing old before their time. Old age is encroaching on the strength of manhood, and the infirmities associated with it are stealthily take possession of the system some years earlier than they were wont to do in former generations. Deaths due simply to old age are now reported between 45 and 55 years of age, and in large numbers between 55 and 60, and there has been a reduction in the age at which atrophy and debility—another name for second childishness—kill those who have passed middle life. Presbyopia, or the long-sightedness of old age, in which near objects cannot be distinctly seen unless held at a considerable distance from the eye, is believed by some experienced ophthalmologists to begin, as a rule, rather earlier than it used to do. No trustworthy statistics on the subject exist, and of course general impressions ought to be received with caution, for it must be difficult to distinguish how far the early recognition of ocular failure in these days is attributable to the increased care bestowed on the eye, and how far it should be ascribed to untimely invasion, but I certainly attach great weight to the opinion of Mr. Critchett, who says, "My own experience, now extending over a quarter of a century, leads me to think that both men and women now seek aid from glasses at an earlier period of life than they would otherwise have done." Very significant also is the statement of Mr. Brailey that "people who have lived long in hot climates like India become presbyopic four or five years earlier than they would otherwise have done," for life in a hot climate really means excessive wear and tear to a European. The ordinary age for the adoption of spectacles for reading used to be 50, it is now, I believe, nearer 45.

Dentists tell us that the absorption of the alveolar processes of the teeth, leading to their looseness and loss, and lastly to the edentulous condition which more than anything else assimilates old age to infancy, sets in now far sooner than it did in former generations, and dermatologists are unanimous that baldness, which Dr. Living says affects chiefly people of nervous temperament with active minds, but of feeble general health, and from which agricultural labourers are most of all classes exempt, begins now earlier than it formerly did. As regards baldness, Mr. Brailey reminds me

that we may infer its vastly extended prevalence in modern times from the fact that the little children who fell victims to the she-bears cried out "Go up thou bald head" to Elisha. The condition was then so rare as to be a reproach, whereas now, although it may be still sometimes a subject of genial banter, it is far too common to be regarded as flagitious.

Senile insanity due to atrophy of the brain, or exaggerated dotage, is, I feel sure, far more common than it once was, and declares itself on the average at an earlier age than it used to do; and I know few more gloomy experiences than to visit our mammoth metropolitan asylums, and wandering amongst the masses of human wreckage there heaped up, to notice the numbers of prematurely old men and women. And senile melancholia, which is sometimes the precursor of dementia, but which often stops short of it, is in a more marked degree spreading amongst us, and including in its victims an increasing number of those who are not really senile as years are counted. Suicides are increasing at all ages; they rose in England and Wales from 1,340 in 1864 to 2,308 in 1888, and from a ratio of 64 to one of 81 to a million living; but it is after 45 years of age that the vast majority of them occur, and it is between 45 and 65 that they are increasing most rapidly. And it is to be remembered that each case of suicide represents a large number of cases of melancholia so pronounced as to be certifiable, and an exceedingly large number comparatively mild, of which we have no official cognisance. My belief is that mild senile melancholia—a state of mental depression falling short of madness, but still morbid enough—occurring at the turning-point of life or soon after it, is a lamentably common complaint, often concealed, but sometimes accidentally discovered, and revealed far more frequently to the general practitioner than to the specialist. Scores of men around us, showing their first grey hairs, who in business and social intercourse wear a smiling countenance, are tormented in private, during the silent watches of the night or at the garish dawn, by a despondency that they can scarcely explain, or that centres in fears they know to be groundless, but that embitters existence, and sometimes renders it almost unendurable.

I have argued that old age is being shortened and that it is overtaking us before its time, and that the cause of this is to be found in the immoderate excitement and fatigue of our modern life, and it may be well now very briefly to inquire what old age really is and whether as we know it it is inevitable.

And to the question "Is old age inevitable?" I would reply. Only in a sense. All created things are subject to a law of evolutionary change. Even the stars grow old. Some of these heavenly bodies have spectra which indicate that they are in the early adult and most persistent stage of stellar life. Others in what is called the solar condition present appearances which prove them to have attained to full maturity. And others again tell by the constitution of their rays that they are in advanced old age and approaching extinction and, by the way, it is curious to note that the young stars are white, and those that have passed their best, orange and red in colour; whereas amongst human luminaries whiteness is a sure sign of antiquity and an orange or red tinge the prerogative of a sanguine variety of youth. And the same law of evolutionary progress that controls the gigantic bodies that, in streams, clusters, and spirals, traverse the avenues of space also dominates the organic bodies that in such infinite variety move on the surface of our planet. Weismann has argued that the amœbæ, algae, and unicellular organisms such as the infusoria are practically immortal, and if not destroyed by heat, poison, or external agencies will go on for ever repeating their simple processes of nutrition and reproduction. But however this may be, there can be no question that all high multicellular forms of plants and animals with well differentiated organs are born with the germs of death in them, and by a physical necessity of their nature pass through certain phases of life. In the human being the metabolic activity of the body, which at first is sufficient not only to cover daily waste but to build up new material, a little later is equal only to balance the physiological requirements of the system and at last is too much reduced even to sustain in its entirety the existing frame. Thus we have three great epochs in human life, one of growth, one of equilibrium, one of decline; and it is the last of these which, strictly speaking,

constitutes old age—the old age which is inevitable, but which as regards its duration and characteristics is something very different from what is generally understood by the term.

Pythagoras used to divide the life of man into four equal parts. From the first to the twentieth year he called him a child; from the twentieth to the fortieth a young man; from the fortieth to the sixtieth a man; from the sixtieth to the eightieth an old man—a man finished; and after this period he reckoned him no more among the living let him attain to what age he might. Shakespeare, more discriminating than Pythagoras, distinguished seven ages in the life of man, but his division is conventional rather than scientific, and with reference to that stage which most nearly corresponds with old age he has fallen into an error, which has stamped itself upon stage representations of old age ever since his time, and so has become part of the popular conception of that period of life. As Dr. Buzzard has acutely pointed out, the alteration in the voice which he ascribes to the lean and slippered pantaloon—

His big manly voice,
Turning again towards childish treble, pipes
And whistles in his sound,

is by no means a frequent concomitant of old age, and is indeed only encountered then when paralysis agitans is superadded to senile decay. Shakespeare evidently took as his model some old man of his acquaintance affected by that disease, and has by his stupendous authority imposed on us an ideal of senility that is radically wrong, for the shrill quavering voice and trembling muscles that characterise it have nothing to do with old age pure and simple—the old age that is inevitable. And so it is with many other features, and these mostly features of a distressing character which are prominent in the picture of old age that we form in our mind's eye, and which, indeed, are in constant association with it as we see it around us. They betoken pathological changes which occur at an advanced period of life, but they are in no way essentially connected with the normal decay of man's powers. It is of course in the autumn of life that wild oats, ripen, and come to fruition. Then it is that the heaped up follies and prodigalities of youth and manhood weigh heavily upon the wearied pilgrim and bow down his pithless back. Then it is that conscience, when there is one, plagues, that the dregs of heredity are seen in the nigh exhausted chalice, that the overstrained machinery breaks down, and that the postponed penalties of all the physiological transgressions, great and small, which in our artificial social existence we are constantly committing must be paid. A whole host of ailments, debilities, incapacities, and disorders undoubtedly attend and embitter old age as we are familiar with it, but I wish to impress on you the truth that a large proportion of these are in it, but not of it, and that the old age that is inevitable is by no means as objectionable a state as that which is prevalent.

The fact that what we habitually regard as the infirmities and maladies of old age are not essential to it you will the more easily realise if you look at them singly and in detail, instead of in groups, as we generally meet with them and think of them; for then it will become apparent to you that there is scarcely one of them that is invariably present in old age. As a rule, the body becomes bent in old age; but we frequently meet extremely old men of an erect and martial carriage. As a rule, the skin becomes dry and wrinkled in old age, but there are many cases in which it continues smooth and soft in octogenarians, even without the assistance of any patent soap. As a rule, the teeth fall out in old age, but instances occur in which they remain sound in their sockets after the average span of life has been exceeded. As a rule, sight and hearing are impaired in old age, but now and then venerable men and women present themselves in whom these senses retain their pristine acuteness. As a rule, memory fails in old age, but not rarely it remains vigorous and trustworthy when senility has reached its utmost limit. And if we turn from the common physiological modifications observed during old age to the pathological manifestations which are most often associated with it and peculiar to it, occurring at no other era of life, we perceive even more clearly that these are not of its essence but accidental accompaniments, attributable not to senile involution, but to degenerative influences

of various kinds. Senile osteomalacia, senile gangrene, senile gout and rheumatism, senile atheroma, senile softening of the brain, and many other senile morbid conditions, although they occur only in the aged, affect but a very limited proportion of them, arise from causes operative long before old age supervened, and must not be confounded with old age itself. Old age may run its course to the century goal without being complicated by any of these senile maladies or crippled by any of the senile infirmities enumerated; and to think of it thus stripped of adventitious misfortunes is to recognise it as a less formidable and deplorable phase of existence than we have been accustomed to suppose it to be. Of course, old age as we actually know it, as it abounds around us, is for the most part "wedded to calamity" and dowered with weakness; but my object is to convince you of the possibility of a typical old age free from all these—a long drawn-out euthanasia, a simple retrogression, the nature of which I shall presently more fully define.

Now I have spoken of three great epochs of life, the epochs of growth, equilibrium, and decline; and that tripartite division of organic history is on a large scale a correct and useful one, but it is subject to qualification, when the events of the three epochs are minutely examined, for the several organs and tissues of which the body is composed have widely different rates of evolution, balanced existence, and decline. They start growing at different age-periods; they enjoy different durations of maximum vigour, they have different turning points on their downward journey, and indeed there are no two organs or tissues that coincide exactly in their development and retrogression. It is a series of separate but successive and intimately related evolutions and involutions that we have to deal with, and while the three epochs named fairly sum up the general results of these, they afford no safe guidance to the chronological position of any one of them. Looked at closely the life of man, like that of a nation, is an aggregate of the lives of individual members and communities, that have lives of their own of subordinate and very varied length. It is literally true that we die daily, and it is equally true that we are daily born again. Old age begins in the cradle and youth still lingers beneath snowy locks. The processes of decay follow hard on the dawn of growth, and formative energies are still at work when decay seems triumphant; and that last truth—the persistence of the formative energies—is the one I particularly wish to emphasise to-day.

The physiological retrogression of individual organs, which takes place early in life, must be familiar to you in several conspicuous examples. You know that the hyaline cartilage which is the first rudiment of bone, is in its very nature a temporary structure. You know that the milk teeth, the eruption of which goes on from the seventh month till the second year of life, having served their purpose disappear from the seventh to the twelfth year; you know that the thymus gland, which is so active in babyhood, grows rapidly until the third year, remains stationary until the tenth or fourteenth, and then gradually dwindles away, passing through an old age of atrophy, and fatty degeneration exactly analogous to the old age of the body generally. You know that as regards bulk, weight, vigour, and functional capacity, some organs begin to show signs of failure long before what is acknowledged as the prime of life. But besides early retrogression, late evolution is familiar to you. You know there are organs and functions which, instead of having a brief and provisional existence, in comparison with the life of the organism, only tardily develop, slowly climb to their perfection of being, and deliberately and partially retrogress.

It is in the nervous system that the most instructive illustrations of late and long-sustained evolutions are to be observed. I need not trace out the slowly progressive development of the powers of sense, movement, and intelligence in infancy and childhood. In every household it is one of the chief charms of life to watch and cherish the gradual budding of these, to fix the wandering eye, to arouse the dormant ear, to steady the tottering step, to guide the groping hand, and to answer the eager questionings of restless faculties rejoicing to find themselves alive in this fair world. Neither need I delineate generally the expansion of the mental functions which goes on during boyhood and youth, and which it is the object of education to stimulate and direct, for that is a com-

plex process which must be carefully analysed before it can supply useful lessons. Let me rather attempt to make clear to you that there are certain centres and groups of centres in the higher nervous system which have an evolutionary cycle larger than is currently understood, some of which are or may be persistently energetic in old age.

There is one group of very highly integrated psychomotor centres situated in the ascending frontal and ascending parietal gyri, in which are represented the movements of the thumb, fingers, wrist, elbow, and shoulder—the movements, in short, of the hand and arm. The evolution of these centres, which commences soon after birth, proceeds actively and visibly during childhood, more deliberately during youth, and I presume we should most of us say that it is complete about the nineteenth or twentieth year, when the maximum of stature is arrived at, for at that time the upper limb seems to have attained its full range of strength and precision of movement. But that is not the case. There is evidence that the hand and arm centres go on evolving till a much later age. It is obvious that great painters and artists of all sorts advance in manual dexterity, in exactness of execution, in everything that goes to make up masterly handling, till middle life or beyond it, but in them the hand and arm centres are perhaps peculiarly constituted, and are assuredly reinforced and disciplined in the exercise of their high calling by other centres interwoven with them. So I shall adduce evidence in support of the adult evolution of the hand and arm centres from a less intricate source.

Some years ago I made inquiries into the training and acquirements of certain classes of operatives in Birmingham, and I then found abundant proof that the hand and arm centres do not reach their full maturity, as measured by their power of doing work, until about the 30th year. A turner, turning buttons out of the cuttings of ivory nuts, who enters that branch of the trade at 17 or 18, will gradually increase his production, becoming quicker and more precise in his movements up till 30, when he will be at his best, and turn out 40 gross or 6,240 vest buttons a day, for a gross in the button business means thirteen dozens. The increment of output on the part of the operative is, of course, an ever diminishing quantity, large at first and fining down to nothing; but there is some increment in a large majority of cases up till the 30th year, and after that none, let the operative strive as he may. And it is the same in all other occupations in which the use of the hand is involved, and in which its labour can be measured. In Bradford I ascertained that weavers of certain classes do not reach the summit of their efficiency until about the 30th year, and in Staffordshire that the potters do not touch the highest point in their productiveness until their 30th year.

Now, the movements comprised in the occupations I have referred to are few in number and simple in character. Once acquired, we should have imagined that the repetition of them would speedily have mounted to the highest possible point compatible with the capabilities of the machinery, human and mechanical, employed. But this is not so, and it enlarges our notions of nervous evolutions to perceive that centres such as those for the hand and arm are still in a nascent condition at the end of the third decade of life. Unfortunately, however, the long nascent period of the hand and arm centres in our operatives is not followed by a proportionately long tenure of adult vigour and agility. Premature old age soon overtakes them. At about 45 years of age the productiveness of manufacturing hands begins to diminish, and after that contracts in a yearly increasing ratio as long as work goes on. In some branches of industry the abridgment of hand power begins even sooner—as early as 40 years of age. A sawyer in the button trade, whose occupation requires close attention and very quick movements of the fingers, who at 40 years of age, when engaged in making vegetable ivory buttons, would saw out of the nuts 100 gross of flats a day, will not at 45 be able to manage more than 80 gross, while at 55 his output will fall to 60 gross, and at 65 to 40 gross a day. Or, to put it in another way, a skilled sawyer who at 40 years of age earns 45s. a week, at 45 will not be able to earn more than 38s., while at 55 his earnings will fall to 24s. a week, and at 65 to 20s. a week, and this reduction in his wage-earning capacity goes on independently of any impairment of eyesight or general health, and is due simply to the fact that his

fingers are less nimble and have lost some of their celerity and exactitude of movement.

That the failure in the hand power of our operatives at 40 or 45 years of age is premature, and due to the excessive wear and tear of the mechanism regulating manual movements, seems highly probable. The minute division of labour in factories and workshops in these days imposes an excessive strain on a few nerve circuits, while great numbers of other circuits are left in desuetude. In primitive employments such as agriculture and navigation, all the muscles of the body are brought into play from time to time in ever varying combinations, but in the industries which modern civilisation has created, small groups of muscles have to repeat their actions with distressing and monotonous iteration. Mr. Frank Smith, of Sheffield, has told us that a penknife maker has to deliver 28,000 accurate strokes with his hammer daily in order to earn a living, and, of course, just so many discharges must take place from the delicate nerve cells of the brain presiding over the muscles lifting and directing the hammer. Little wonder that these cells, firing 28,000 rounds a day, should sometimes become overheated and kick. Little wonder that we should have many cases of professional hyperkinesia or fatigue disease, or that untimely old age should affect the hand and arm centres amongst our operatives.

When subjected to no unreasonable treatment, but well and wisely used, the hand and arm centres retain their cunning in its highest degree long beyond the forty-fifth year, and although some failure in their power is amongst the inevitable consequences of advancing years, that failure need never be extreme. In rare instances the hand has kept its full potency at a ripe old age. Michael Angelo was drawing superb designs for St. Peter's at Rome shortly before his death in his eighty-ninth year, and I know examples now of men over seventy whose handwriting is as good as it was at forty, and who, after testing themselves, assure me that they write with as much facility and rapidity as they then did.

But there are other centres in the brain evolved later than those for the hand and arm which longer than they remain fully competent to the performance of their duty. The emissive speech centres in the brain, the motor centres for the lips, tongue, mouth, or organs of speech, which are situated in the third frontal convolution, and perhaps in the island of Reil, on the anterior edge of the motor area, are slower than those for the hand and arm in growing to adult strength and skill. The infant and child laboriously learn to articulate, and throughout youth and early manhood the acquisition of language goes tardily on. I cannot pause to explain the mechanism of speech or distinguish between the parts played in its production by the auditory and motor centres and the higher centre in which concepts are elaborated; but taking volitional language as a whole, I would point out that the command over it is greatest between 45 and 55 years of age. I do not mean to convey that men and women are most talkative then, but I maintain that, as a rule, it is then that they use the greatest number of words to express their ideas, and employ them with the most precision and propriety.

Amongst ordinary mortals, it is difficult to ascertain when their scanty vocabulary is richest and most fluent, but even in them it might, I believe, be demonstrated by well-planned observations that between 45 and 55 their powers of expression are at their best. Amongst orators there can be no doubt that it is at this time of life that their special endowments have secured for them their highest triumphs. Demosthenes, whose ambition was early kindled, did not deliver his greatest speech—*De Corona*—which has been described as the most magnificent vindication in the annals of oratory, until he was 52. Burke, whose training was desultory, astonished the House of Commons by his speech on American affairs when he was 36, but only achieved his masterpiece, his impeachment of Warren Hastings—an effort of eloquence unparalleled in its energy and effect, and which must have exhausted his speech centres, for it left him at one point deprived of the power of articulation for a little—when he was in his 58th year. Curran, of whom Byron said, "He has spoken more poetry than I have ever written," made his most brilliant speeches in the State trials in which he appeared between his 44th and 47th years. And John Bright, whose fiery declamation on behalf of the Anti-Corn-law

League began in his 28th year, may be said to have exhibited his control over language in its finest perfection in speeches delivered subsequent to his election for Birmingham when he was 46. My friend Mr. Barnett Smith writes to me: "I have heard all the greatest speeches of the greatest orators of my time—Parliamentary, pulpit, and platform speakers—Butt, Lowe, Disraeli, Bulwer Lytton, Derby, Parnell, Gough, and all had their most splendid period from 45 to 55 years of age."

With respect to written language, the evidence that its choicest evolution comes in what is called middle life is, I think, cogent and conclusive. Literary genius has often blossomed early and withered too soon to allow us to judge of the best bloom of which it was capable; but whenever literary men have lived to middle life or beyond it, a progressive expertness in their use of the verbal instruments of thought is discernible in their writings. I must not weary you with illustrations, but let me just recall to you that *Paradise Lost*, a poem which, if it possessed no other merit, would be for ever remarkable for its wealth of words, was completed when Milton was 57, having been written in the five previous years; that the translation of Virgil—"noble and spirited," as Pope calls it, and "Alexander's Feast," of which Hallam has said "Every one places it amongst the first of its class, and many allow it no rival," were written when Dryden was 66, and that *The Lives of the Poets*, Johnson's greatest work, was composed when he was 72 years old.

Two journalistic friends, both over 50 years old, who have kindly made a few experiments for me, assert that they have a greater flow of language now than they had twenty years ago, the flow being measured by the number of words used in a certain number of pages of composition, and also that they can produce as much copy in a given time as they then did, so that their speech centre as yet shows no diminished briskness in action.

That these speech centres are subject to decay and disintegration is unfortunately too true. Large and complex in men of high mental calibre, small and simple in men of mediocre ability, and rudimentary in form in idiots and deaf-mutes, the third frontal convolution is especially liable to be broken up by hæmorrhagic extravasations or softenings, with consequent impairment or loss of speech, and aphasia in its several forms seems to stand in almost the same relation to the literary calling that arm palsy does to the hammerman's craft. But, short of aphasia and within physiological limits, there is a curtailment of the power of speech that is incidental to advanced years—a forgetfulness of words—especially of proper names and nouns, but this curtailment need not necessarily pass into *amnesia senilis*—a pathological state indicative of wasting of the brain. The impairment of speech that is inevitable in old age, and which is not incompatible with garrulity, is of a kind and degree that need not be seriously embarrassing, and it ought not, in presence of well ordered lives, to present itself until a much later age than that at which we more commonly notice it.

In front of the speech centre, in the brain, there are large masses of cerebral substance—the frontal lobes that yield no response to electrical stimulation. These lobes, which are rudimentary in the different orders of animals, reach their highest development in man, and in different races of mankind and different individuals of the same race are always best developed in those that have the highest intellectual powers. Destruction of these lobes, experimentally in monkeys and by disease in man, is followed by loss of the faculty of attention, marked intellectual deficiency, and instability of character, and it is no longer doubtful that in these lobes are situated the substrata of the psychical processes that lie at the foundation of the higher intellectual operations. In them are a series of centres subserving the highest human powers, evolved later than the speech centres, and probably longer than the speech centres retaining their functional vigour. An analysis of the powers here located is of course impossible on this occasion, but it will be sufficient for my present purpose to tell you that judgment and reason are certainly dependent on the integrity of these centres. Now judgment and reason, I would suggest, come to their perfection later than speech—in all likelihood between the 55th and 65th years, and may be exercised justly till an advanced age. Wisdom does not always come with years. Heine made his good Pole say,

"Ah! that was long, long ago; then I was young and foolish, now I am old and foolish;" but still the counsels of grey beards, free from the ardent passions of youth, and well stored with experience, have been valued in all stages of the world's history, and it would be easy to show that a preponderance of the works pre-eminently implying the use of calm and powerful reason must be ascribed to men over 55. Bacon was 59 when he produced the first two books of the *Novum Organon*; Kant was 57 when the *Critique of Pure Reason* appeared; Harvey was 73 when his great work on *Generation* was given to the world; Darwin was 50 when his *Origin of Species* was issued, 59 when his *Variation of Plants and Animals under Domestication* was published, and 62 when his *Descent of Man* appeared. In almost all nations the decision on the most momentous affairs of State has been reserved for a Senate; and it is highly noteworthy that our system of jurisprudence in this country—a fabric of which we are justly proud—has been built up by judges from 55 to 85 years of age. The late Dr. W. B. Carpenter said to me when nearly 70 years old, "I am conscious of the decline of life. My perceptions are a little dull, and my memory has lost its grasp. I could not now trust to its safe keeping long strings of words as I did when learning my Latin grammar as a boy, but I am convinced that my judgment is clearer and juster than it ever was, and my feelings are not blunted."

But besides judgment and reason there are other powers of mind in all likelihood localised in the frontal lobes. The moral sense and religious emotions have probably here the substrata necessary for their manifestation, and these, although influential in some degree throughout life, evolve most munificently last of all. The fruit is mellowest when it is ready to fall, and the old man free from canker or blight sometimes displays new sweetness and magnanimity when his course is all but run. Let me turn to Shakespeare for an illustration of the final and most exalted evolution of man's terrestrial existence, which now and again, even in degenerative times, makes old age beautiful and inviting.

Shakespeare never reached old age, as measured by years—he died at 53; but with the impatience of genius, he lived the whole life of man in half the allotted time, and shows us in his writings, in due order, in rich luxuriance, in perfect proportion, the whole produce of which the best English brain is capable; and it is therefore with consolation and encouragement that we find in the last period of his literary activity, the period corresponding with old age in the average man, when bodily infirmity had probably overtaken him (for why else did he suddenly retire to the country when at the height of his reputation, and making money?)—it is with consolation and encouragement that we find at this period a new evolution of his powers, higher than anything before manifested. *Cymbeline*, *The Tempest*, and *The Winter's Tale*, the fourth period plays, written when Shakespeare was 47 or 48 years of age, do not exhibit the subtlety and strength, the dark speculation and majestic reflection, the passionate depth and prodigality of diction of the great tragedies of the third period—*Hamlet*, *Othello*, *Macbeth*, *Lear*, *Julius Caesar*, and *Antony and Cleopatra*, written from two to ten years sooner, but they mark a transition from anger and conflict to reconciliation and peace. "In these fourth period plays," says Professor Dowden, "Shakespeare had attained an altitude from which he saw human life in a clear and solemn vision, looking down through a pellucid atmosphere on human joys and sorrows with a certain aloofness or disengagement, yet at the same time with a tender and pathetic interest.....The writer of these exquisite plays has none of the lightness of heart which is the property of youth; he knows the wrongs of life; he sees the errors of men, but he seems to have found a resting place in faith, hope, and charity. The dissonances are resolved into harmony, the spirit of the plays is one of large benignity; they tell of the blessedness of forgiveness, they show how broken bonds may be repaired and reunited; each play closes with a victory of love."

The imitation of Shakespeare would not be an adequate or feasible ideal to place before mankind in these days; but no better pattern of the temper, spirit, and piety that ought to preside in life's closing scenes can possibly be presented than that set up in the romantic comedies of the fourth period. We toil and moil through four-fifths of life with our

eyes fixed on the last act—a short span of gilded dotage, an almshouse, a pension, or a peerage. Would it not be wiser to hold in view a crowning evolution of our qualities, a choice abstract of our experiences, a sublime crisis in which, although natural force is abated and the physical powers flag, the moral nature, disentangling itself from selfish ties and the thralldom of passion, rises to serene heights of virtue, where love drives out fear, and faith, strengthened by suffering, reigns supreme over all?

And such an old age is not an idle dream. Cicero looked at old age from the standpoint of self-assertion rather than from that of self-sacrifice. His ideal old man was an august Roman patrician, crowned with the laurels of the victor, powerful in the counsels of the State, stern and rigorous, still capable of new acquirements, like Cato the Censor, at 84. But even Cicero has left us softer pictures of the epoch—as in that of Appius, old and blind, but revered and beloved, and animated by the fervour of youth—and has described it as a time that may be easy and delightful, in which, after a long voyage, sight of land is obtained, and the heart discharges itself of petty rancour. We, with our horizon wider than that of Cicero, are able to see in old age, even in humble life, blessings and alleviations that were beyond his ken, and obtain at least glimpses of the truth that its chief glory consists, not in the remembrance of feats of prowess or in the egotistic exercise of power, but in the conquest of peevish weakness, in the brightness of hope, and in the dissemination of happiness around. Depend upon it, the best antiseptic against senile decay is an active interest in human affairs, and that those keep young longest who love most. It is a cogent argument against celibacy that it can hardly hope in its isolation to enjoy a green old age, lacking as it does those vernal influences in which parents renew their youth—

And when with envy time, transported,
Shall think to rob us of our joys,
You'll in your girls again be courted
And I go a-wooing in my boys.

Our own profession—the medical profession—can supply some admirable studies of old age as it ought to be, "a lusty winter, frosty, but kindly." "I witnessed," wrote the late Dr. Parkes, "a beautiful old age in Sir James Clark, physician to Her Majesty the Queen, a man of singular moral power and of very balanced and even mind; in character most lovable—the incarnation of beneficence and affection. He lived till nearly 80, and was active and useful to the last." The Autocrat of the Breakfast Table, Dr. Oliver Wendell Holmes—genial and witty as ever, and now engaged on a preface to a new edition of his works—celebrated his 82nd birthday on August 29th last, and then said: "It is a surprise when we find ourselves growing old; it always comes on us as a shock when we discover that others regard us as old. Life seems more and more like a dream as one reaches old age. I am well and very happy. My eyesight troubles me somewhat, but I have no other physical ailment." And, amongst the rank and file of our profession, there are countless examples of men unknown to fame, who, with ripe knowledge and quiet devotion, ply their calling and are looked up to in their neighbourhood when past three score and ten—men of the stamp of Dr. Welsh, of Haddington, of whom we should never have heard had not Carlyle married his daughter, but of whom Edward Irving said: "He was one of the wisest, truest, and most dignified of men." I have often thought that Gray's *Elegy* was defective in having no verse commemorative of the sequestered and unsophisticated philanthropy of the village doctor.

I have hinted to you, ladies and gentlemen—for in the time at my disposal I can scarcely more than hint—that in the higher nervous centres evolution goes on late in life, and that even in what is called old age the freshness of youth may sometimes survive. And I have hinted also that the natural evolution of the nerve centres is largely interfered with by our habits of life and methods of work; and that retrogression is prematurely induced, and old age abbreviated and so loaded with infirmities that it is regarded with apprehension instead of with quietude and contentment. And if you ask me now to what extent retrogression is hastened and old age abbreviated, I must tell you that I think it a good working hypothesis that the natural life of man is 100, and that in so far as it falls short of that it is "curtailed of fair proportion."

I would especially exhort the medical students now before me to start with a resolution that they will not be content with a duration of life shorter than that either for themselves or their patients. They may not always be able to realise this fixed purpose, but they will work all the better for having a high standard before them.

Flourens's neat and portable formula that the duration of any animal's life may be calculated by multiplying by five the number of years occupied in the union of the epiphyses of its long bones with their shafts is not applicable in every case; it fails, indeed, in the case of man, in whom the coalescence of the epiphyses is not complete until his twenty-fifth year; but, nevertheless, Flourens's conclusion that man is entitled to a century of existence was, it must be maintained, substantially correct. Buffon thought that the duration of life was six or seven times that of growth, and in this he was in error, for it is probably about five times; but he did good service in insisting on the truth that as each animal has its definite form, its limit of size, and its fixed period of gestation and of growth, so each has its fixed period of life, which depends neither on food, climate, or variety, but on the constitution of the organism. According to Buffon's view, each animal is projected into life with an impetus equal to carry it a certain distance against average resistance, and that impetus in the case of man ought to carry him just 100 years; but the increased friction to which he is exposed by all sorts of artificial obstacles strewn in his course leads, in an immense majority of cases, to his arrest in his career at a point far short of his natural goal. Still, however, a select few do reach that goal, and even run beyond it; and it is upon this accomplished fact, rather than on *a priori* reasoning, that we should base our hope that in the good days coming, when sanitary wisdom shall prevail in the land, and the gold fever and typhoid fever are alike stamped out, numbers of our species may be able to count on a round hundred years of wholesome happy life, and an inevitable old age, tranquil and interesting, unmarred by the morbid accessories which are now generally attached to it. It is the power of reproduction possessed by the cells of the organism as controlled by certain nerve centres that really determines the duration of life and the character of its decline.

Centenarians are not now the *rare aves* which they were once supposed to be. In England and Wales in 1889 the deaths of seventy-six reputed centenarians were reported, and of late years a great number of cases have been strictly inquired into in which there could be no reasonable doubt that life had been prolonged beyond 100 years. And these cases have been inquired into, not only as to the legitimacy of their claims to have made out their century of life—with the result that the tables have been effectually turned on Sir George Cornewall Lewis and Mr. Thoms—but also as to their bodily and mental characteristics, so that we now know something of centenarian pathology, and recognise the fact that those who live to a hundred do so by virtue of their freedom from degenerations, and succumb to inevitable old age, which may be described as simple and general atrophy. But this simple and general atrophy, although of gradual invasion, need not very seriously cripple the centenarian until close upon his term of dissolution, and cases might be quoted of much activity and enjoyment in life even beyond a hundred years of age. I daresay some of you recollect one of Du Maurier's graceful cartoons in *Punch* last summer, representing a shattered octogenarian hobbling into a drawing room on two sticks, while a radiant maiden meets him exclaiming: "Oh, grandpapa dear, such fun! the fortune teller has come; do come and have your fortune told." Du Maurier's shaft was aimed at a fashionable craze, but as a matter of fact there are many grandpapas with much of good and evil fortune before them which it would puzzle the prettiest and wittiest of inspirationalists to foretell. According to our estimate a man at 80 has a fifth of his life before him, and in twenty years what may not happen? Sir David Brewster married at 76. Four years ago, in Vienna, Janos Meryessie, aged 84, attempted suicide, his reason being that he could no longer support his father and mother, who were aged 115 and 110 respectively; and in the *BRITISH MEDICAL JOURNAL* of May 9th last there was given the portrait of a brave old man, who at 102 had undergone an

operation for cancer of the lip without anæsthetics and without flinching.

Senile involution, when cell growth is more than counter-balanced by cell decay, is the natural pathway to death, and a man ultimately dies of it when there is no question of disease, as soon as the advancing wasting of his vital organs reaches a stage at which they can no longer efficiently perform their functions. But the atrophy, although general, is not always uniform, and the shrinking and loss of substance is in one case more advanced in one organ, and at another in another; so that there are varieties of even normal or inevitable old age. A functional decline, followed by structural alteration, as in the organs of locomotion, is one of the most obvious of the phenomena of inevitable old age. The desire for active exercise is no longer felt, the movements become feeble and sluggish, and then the contractile substance of the muscles contained within the sarcolemma dwindles away, while the more vascular and cancellous parts of the bones undergo absorption, and the cartilaginous parts of the skeleton grow thinner, thus causing a diminution in height. At the same time, or subsequently, in the structural matrix of the vessels there is a deposit of fatty material, which diminishes the elasticity of their walls, and according to its distribution, interferes with the nutrient supply of different parts of the system. Later, again, the epithelial glandular elements of the alimentary canal undergo wasting, and this leads to further nutritive decline; and loss of appetite is, in a sense, the measure of old age, and a digestive breakdown is often its end. Old Parr died at 152, from an overloaded stomach. The atrophic changes of old age in the higher nerve centres may be likened to those in the eye. The brain, like the lens, becomes flatter and less elastic, and the muscular fibres of the arteries which modify its form have become feebler and slower in action, so that a sort of mental long-sightedness is induced, a state in which near objects—the events of to-day—are not distinctly perceived, because the rays of attention cannot be accurately converged upon them; while distant objects—the events of past years—are still clearly outlined in memory. But the lines of invasion, and ultimate distribution of senile atrophy in the brain and nerves, cannot be here mapped out. Suffice it to say that that atrophy, in as far as it is due simply to senile decay, has, I feel satisfied, a very distinct localisation.

The atrophic changes which have been enumerated as characteristic of old age are not altogether beyond remedial treatment. Curable, perhaps, they can scarcely be called, but much may be done by change of climate, by regulation of diet and of habits of life, and by therapeutic agents, to slacken their progress or arrest their advance. You will be able in many ways to lessen the frailties of your senile patients, although you will not be able to confer upon them that rejuvenescence which many of them, and those generally the most dilapidated, will expect of you.

Since the days of the Ptolemies, when it was believed that emetics and sudorifics would abolish the tendency to death, down to the present time the search for the *elixir vite* has gone on interruptedly, and visionaries and quacks have continued to delude or prey upon mankind; and a study of all the means proposed at various times for the indefinite prolongation of life or the restoration of youth conduces to the humiliating conclusion that the superstitions of the *fin du dix-neuvième siècle* are not less silly than any that have ever afflicted the world. "The secret spirit of the adepts"—acetone—had antiseptic properties, and the cordials of the Middle Ages, containing lavender, cloves, peppermint, etc., at least set up gastric irritation, and produced a sensation of internal warmth; but what shall we say of green electricity, of Brown-Séquard's nostrum, or of the discovery of Prophet Harris, announced only a few weeks ago, that by a novel kind of respiration he can renew the structures of the body, and insure immortality!

There is no short cut to longevity. To win it is the work of a lifetime, and the promotion of it is a branch of public medicine. Perchance, one of these days, we may have an International Congress on Old Age, with an exhibition of dotards for warning, and of hale and hearty centenarians for encouragement. At any rate you may rest assured that it is by steady obedience to the laws of health that old age may be attained, and by judicious regimen that it may be prolonged. The measures necessary for the promotion of old

age on the large scale lie beyond the control of the medical profession. We cannot change the spirit of the age, abolish avarice, vainglory, and the lust of power, or quell even the gratuitous excesses of the struggle for existence that rages around; but we can do something by pointing out to those who will listen to us some great perils that may be avoided by inculcating the principles of mental hygiene; and we can give the weight of our support to all movements calculated to promote the betterment of our race; and I would instance, as a movement of that kind specially related to my theme to-day, the project for national insurance against old age, which Mr. Chamberlain has done so much to advance. Life insurance has, by the tranquillity of mind which it has conferred on those who have taken advantage of it, done much to avert madness and prolong life; and national insurance against old age, by removing those apprehensions that must now sometimes harass even the bucolic mind, apprehensions of pauperism—so ignominious to an Englishman—when work is done, would, I am confident, conduce widely to the attainment of sound and pleasurable old age, a possibility which should not be lost sight of in the preparation of the tables on which old age pensions are to be calculated.

It is not for me to convert this platform into the pulpit of the preacher, but the office of the mentor to-day in some degree belongs to me, and I should feel that I had not fully performed my duty if I closed without a word of admonition drawn from my own adventures, to those who are beginning to tread the path that I so long have trodden. To them I would say very earnestly—Do not, in greed of knowledge or pride of skill, forget that there is a moral side of your nature which requires cultivation, and that ethical training is not less necessary than intellectual training to all worthy success in life. Whoever contrasts our medical students of to-day with the medical students a quarter of a century ago cannot but be struck by the marked improvement that has taken place in their conduct and demeanour. A somewhat tumultuous and peccant element that perturbed the medical student body of the past and sometimes reflected discredit upon it has been eliminated; and taking medical students of to-day as a class, one may safely affirm that there is no large group of young men in the community more correct in behaviour, more circumspect and self-respecting. But contrasting only the best students of twenty-five years ago with the mass of students of to-day, and endeavouring to estimate the probable effects of the systems of teaching in vogue then and now, I think I detect amongst the enormous advantages of the new system some small risks which it may be not inexpedient to indicate. The medical student of to-day is infinitely better taught than his compeer of the past. He has a far larger and more compact mass of precise information communicated to him; he is drilled to a proficiency in practical work formerly unattempted, and pains are taken to make him methodical and ready; but it is just possible that the intense concentration of attention on minute details, and the laborious acquisition of a huge pile of facts, may tend towards self-sufficiency and some narrowness of view. The medical student of the last generation, on the other hand, in his comparatively neglected state, lectured and left to his own resources, compelled to thread his untutored way amongst obstacles as best he might, but with time to think and bound to generalise for himself, gained at least breadth of vision and learnt humility. Why, the textbooks of the two periods suggest this difference in tendency. To-day the medical student does his reading out of a long array of small, condensed, perspicuous, smartly bound and extremely cock-sure manuals. Of yore the medical student pored over a few huge, dingy tomes, requiring a stout table to support them, always ponderous, sometimes vague and speculative, but generally learned and philosophical.

But perhaps the chief danger of studies such as these the medical student is now called upon to prosecute is that, if too exclusively and sordidly pursued, they may end in some hardening of the moral nature. Happily hitherto they have never been pursued in such a manner, but with magnanimity and unselfish devotion, and so medical men have been and are distinguished by the fineness of their sensibilities and the warmth of their benevolence. "I believe," said Dr. Samuel Johnson, "every man has found in physicians great liberality and dignity of sentiment, very prompt

effusions of beneficence, and willingness to exert a lucrative art where there is no hope of lucre." This creed of Dr. Johnson will be cordially repeated to-day by everyone who has any knowledge of our profession, and all the more it behoves us to provide that the high ethical standard hitherto observed shall be maintained by those who come after us, and to counteract, as far as may be, any tendency of our present educational system unduly to exalt the senses and intellect at the expense of the emotions and will, or in cramming in knowledge to squeeze out sentiment.

And sentiment, gentlemen, is not an article of luxury or a mere elegant accomplishment. To you, in the daily routine of your future work, it may prove an excellent auxiliary of your medical and surgical attainments. I once heard the late Sir William Gull declare that sympathy is as necessary to a physician's success as clinical or therapeutical ability, and I am fully persuaded that in you, if you are to be useful in your sphere, there must be, deeper than the glossy surface of polite manners, which, like all glossy surfaces, involves some dissimulation, a core of genuine sympathy. It is not gush that is wanted, no such agitation of feeling as may disturb the operations of the intellect, but a controlled compassion which quickens insight, and gives gentleness to the touch, while it inspires confidence in the patient, and nerves him to aid the doctor in shifting the burden of disease. And besides sympathy, although sympathy implies much, you must have in vigorous life other altruistic and some egotistic emotions if you are with dignity and devotion, and for personal and public benefit, to practise your art. But in order that they may enjoy vigorous life, emotions, like bodily organs, must be nourished and exercised, and hence it is that I plead for a recognition of ethical training in medical education, and remind you that your object here should be not only instruction but discipline.

No one realises more thoroughly than I do the need of unswerving application and singleness of purpose in the medical student of the period. His task is Herculean, his time is limited, and onerous are the responsibilities that lie before him. "It is an incomparably less guilty form of robbery," says Ruskin, "to cut a purse out of a man's pocket than to take it out of his hand on the understanding that you are to steer his ship up channel when you do not know the soundings." The medical man has precious human argosies to steer up the channel of disease, storm swept and studded with rocks and shoals, to the harbour of health, if may be, and heavy and stringent is the obligation that rests upon him to make himself intimately acquainted with its pathological soundings. Only by assiduous and prolonged study can he hope faithfully to prepare himself for his work. And yet he must not bury himself in study, nor become a beardless anchorite. Some intervals of leisure must be found, if he would be strong as well as acute, tender as well as positive, refined as well as business-like, for the claims of family affection, for communion with Nature, for friendly fellowship, for manly sports, for social recreation, for intercourse with the choice spirits of literature, and for dalliance with music and art. It is in itself an ethical advantage to you in this school to be connected with the Victoria University, and so to have an academic influence thrown over you, and to be brought in contact with those engaged in departments of study other than your own. And it is a still greater moral privilege to have as teachers men of eminent gifts and high character, who, while directing your studies, cannot but impart a healthy bias to your active powers. Hero worship is an undying cult. You are at the age when the need of it is paramount, and you are happy in having within your hospital and school approved good masters to whom you may yield deserved homage and upon whom you may model yourselves with safety.

Last of all, gentlemen, I would say, bring a spirit of reverence to your studies, and be not carried away by the foolish fancy that it is manly, and a sign of cleverness to scoff at the traditions of the past and cast aside the simple tenets of your childhood. You have to be doers, not talkers. You have to face realities, but if you keep alive in you that religiosity which the greatest anatomist of modern times has pronounced characteristic of every form of the human race, you will be able to see through the realities of sense—suffused with pain and error as they are—to a higher reality that lies

beyond, and that is all goodness and truth. What a few generations of agnosticism might do it is impossible to forecast, but infants are not yet born materialists. They soon display a vivid and fearful belief in the supernatural, and in boys and girls faith burns up a clear lambent flame, which, as it is tintured or tampered with, assumes various shades and colours, or flickers and dies out in hopeless extinction. Tend well that flame in your own breasts, and hold it sacred in the breasts of others. At all costs the eternal verities, when known, must be accepted and spoken, but it is suicidal wantonness to go in search of doubt, and it is homicidal cruelty to scatter poison "on a smiling land" and suggest the incompatibility of science with the most sustaining convictions of mankind, when that incompatibility is not absolutely proven. Evolution without design, it seems to me, would be not evolution, but fortuitous fluctuation, and to use, in connection with evolution, as is constantly done, the terms higher and lower is to import into the notion a teleological element. The resources of the universe are not exhausted; there is room in the nebulae for all that it has entered into the heart of man to conceive, and the possibilities of imaginative conception are not the limits of existence.

ON

THE STUDENT AND THE PRACTITIONER.

Delivered at the Opening of the Medical Session of University College, London.

By VICTOR HORSLEY, F.R.S., F.R.C.S., B.S.,

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I HAD considerable hesitation in accepting the responsibility of addressing you to-day from the feeling that it would be impossible for me to say anything to you which had not been vigorously and eloquently discussed by one or other of my predecessors. On inquiry, however, I found that almost without exception these addresses were devoted either to the consideration of medical politics, or of recent changes in medical education, or, finally, to the panegyric of medicine as a splendid and noble profession. On this last point it is, I believe, quite unnecessary for me to further dilate. In the first place you would not, I am sure, have selected it as your means of gaining a livelihood had you not been fully convinced of its merits; and, secondly, so striking an object lesson in disinterestedness is being daily afforded by the members of the profession already engaged in it, that no words of mine are needed to emphasise its virtues more clearly. I do not myself know of any other profession the constant aim of whose members is to deprive themselves of their own sources of income for the good of the public, yet this Quixotic act is that which is exemplified by all those who are striving to forward sanitary work and to strike at the roots of disease. I may perhaps add that the public are not apparently conscious of this view of the case, or organised attacks on such individuals as Pasteur, Lister and others and their followers would not be permitted, and the rewards which would be assigned to such benefactors of society would more adequately represent their services. As, however, I have been saying, disinterestedness is a distinguishing mark of the profession, and both the public and the State seem equally determined that it shall continue to be so.

On the subject of medical politics I shall only speak in passing, as the sole point of interest at present is that the University of London, with a Senate that represents directly nothing in particular, none of whose members, with one exception, is in touch with the present teaching in the medical schools, and which has demonstrated its general incapacity by failing to reform itself, is about to witness the foundation by State interference of a rival university to satisfy the very obvious and reasonable requirements of London students, though at the cost and trouble necessarily involved in the existence of two universities. However, no extensive reform

has ever been accomplished without considerable waste of time and energy, and it must be supposed that the inability of the present Senate of the University to do more than carry out the wishes of Convocation many years after that body has proposed changes will gradually be converted into efficiency as soon as the wholesome pressure from without shall have sufficiently metamorphosed the conditions prevailing among its members.

Medical education, on the other hand, is, like the poor, always with us, and offers like them many suggestive problems. Being a branch of physical science, it is always changing, always requiring reform as general knowledge increases. I shall to-day only incidentally touch upon one or two points connected with it, as I intend to devote the time allotted to me in considering a subject which concerns us all, namely, what the factors are which shall enable us to succeed in the practice of our profession, not merely to succeed in gaining a livelihood, but in properly fulfilling the other part of our duty, the furtherance of general medical science by the accumulation of fresh facts, and the invention of fresh procedures for the relief of suffering humanity.

The mere fact of our entering a profession at all means, as a rule, that we have to make our way, and the question must be very forcibly before all of you at this moment (as I well remember it was before me when I was one of the audience), What opening will there be? What can possibly turn up that should offer at the end of one's studentship the opportunity of earning a livelihood?

It is my desire to endeavour as far as I can to point out what openings there are, and from my brief knowledge of the world what precautions are advisable to secure success. Let us take what we may regard as the baser point of view first—I mean the commercial or business aspect of the question. And here let me say at once that whereas in many respects our giving our work for money differs notably from ordinary transactions of commerce, it does seem a ridiculous travesty of sense that the justly honoured position of the Fellowship of the College of Physicians is hampered by the anomalous restriction that the holder of it may not recover by ordinary legal process what is most justly due to him and honestly earned. We all have in our hands the capability (and it is most widely exercised) of foregoing monetary obligations in cases where the circumstances of the patient make such an abnegation a pleasure, but there is no reason why the unscrupulous should be able to obtain by deliberate fraud without payment medical services of the utmost importance and value. Looking at our work, then, from the point of view of practice as a commercial process, it seems to me that the problem to be considered resolves itself into, What do our patients ask for from us? If a patient or his friends come to you, there are three things which he or they wish to know:

1. What is the matter with him?
2. How will it end?
3. How can he be relieved or cured?

Now the first of these is diagnosis, the second prognosis, and the third treatment. Of these, to my mind, the second—namely, prognosis—is unquestionably the most important to the patient and his friends, and it is plain why this should be so. For in the large majority of cases, even if their nature be explained in the easiest possible and most popular manner, the public learn little or nothing from the statement that they have such and such a disease; and even if, as appears to be the developing fashion, they buy a dictionary of medicine, and read up the article which treats of their particular complaint, they are very little wiser. They come to you, therefore, for your special or expert knowledge of what the disease will do, how it will end, and what will be their future; and this is the most difficult part of our work as well as the most important.

Many think that an empirical knowledge of treatment is the royal road to success, and that it is enough to cultivate that. I am sure this is a profound mistake. If it were really so, then quackery would take the place of scientific medicine, since there are always a number of dupes ready to testify to the wonderful virtues of any given quack treatment, and blazon abroad at the same moment its powers and their own credulity. The fact is, that although numbers of the public, especially of the highest and lowest classes, who for different reasons are the furthest removed from science, are